PADCO, Inc.

Planning & Development Collaborative International, Inc.

Housing Finance and Municipal Advisory Program for Poland

FINAL REPORT

DEVELOPMENT OF A SCIENCE AND TECHNOLOGY PARK IN KRAKOW

April 1996

Prepared for:

United States Agency for International Development

Prepared under:

USAID Contract No. EUR-0034-C-00-4029-00, RFS-29

PADCO, Inc.
1012 N Street, N.W.
Washington, DC 20001

Research Triangle Institute
P.O.Box 12194
Research Triangle Park, NC 27709

FINAL REPORT

DEVELOPMENT OF A SCIENCE AND TECHNOLOGY PARK IN KRAKOW

Prepared for:

United States Agency for International Development

Prepared by
James S. McCullough
Research Triangle Institute

April 1996

USAID Contract No. EUR-0034-C-00-4029-00; RFS-29
DEVELOPMENT OF A SCIENCE AND
TECHNOLOGY PARK IN KRAKOW

James S. McCullough
Research Triangle Institute

1. INTRODUCTION

1.1 Purpose of the Report

This report has been prepared as part of a technical support mission sponsored by the United States Agency for International Development (USAID) and carried out by the Research Triangle Institute (RTI) under the Housing Finance and Municipal Advisory Program for Poland. The technical support is intended to assist Jagiellonian University and the Krakow City Government in the initial planning of a science and technology park (STP) in Krakow.[1] For convenience, we refer to "science and technology parks" and "research parks" interchangeably in this report.

This report draws on the experience in developing such parks elsewhere, especially those with direct university participation. In this report, we identify the key factors for research park success and the procedures that should be followed in the initial stages. The results of this assistance should enable the planners of the Krakow STP

[1] The proposed development in Krakow has been variously referred to as a "Science and Technology Park," an "Academic Technology Park," and simply a "research park."

to prepare a guide plan for developing the park which contains the key activities and decision points.

In preparing this report, we have relied on published reports concerning the development of university-affiliated research parks worldwide (which now number over 300) as well as first-hand experience in the development and growth of the Research Triangle Park (RTP) in North Carolina.

A first draft of this report was used in a workshop conducted in Krakow on March 7, 1996. The workshop included presentations on the contents of this paper, the prefeasibility study prepared by International Development Ireland, Ltd. (IDI), and development concepts from both the Krakow university community and the Krakow city administration. The workshop was attended by approximately 50 participants from the members of the Consortium responsible for developing the Krakow STP. All participants had received the draft copy of this paper (in Polish) prior to the workshop. The workshop was very productive in raising the key issues that must be dealt with by the Consortium—all of which are described in Sections 3 and 4 of this paper.

1.2 Background of the Krakow Science and Technology Park

The Krakow STP is envisioned as a component of the proposed expansion of Jagiellonian University to a third campus in Krakow. The park is also viewed as an embodiment of the role of the university in:

> …a new kind of partnership among national and local governments, universities and the private sector…an up-to-date approach to the commercialization of scientific research…an effective response to the challenges of the free market—a response that would also use science to stimulate the development of many branches of the economy.[2]

The area designated for the park and adjacent campus lies southwest of the city center in an undeveloped tract of land. Appendix A provides a map of the site. The tract lies quite close to the city center but is not yet serviced by a road network. It is midway between the city center and the ring road that gives access to the airport.

According to the initial design concept, the Krakow STP would contain 30 hectares (about 74 acres); the university already owns about 15 Ha of land in the area. A

[2] Jagiellonian University, *Krakow Academic Technology Park*, Concept Paper, Krakow, 1995.

physical master plan for developing the entire area has been prepared and approved by the Krakow City Government. In its preliminary planning, the university proposes to house two institutes in the park—an institute of molecular biology and biotechnology and an institute for medical, biomaterial, and environmental engineering—as well as a small business incubator and possibly a management institute. Beyond the initial concept, detailed planning has not been carried out, awaiting a more detailed pre-feasibility study which has been carried out under sponsorship of the Irish Government by IDI[3].

This report is intended to complement the IDI study by providing an independent "checklist" of success factors and a guide for development procedures.

There is already clear evidence of the general feasibility of developing such a park. Krakow possesses the key ingredients that have been found to accompany such successful research park developments elsewhere, namely:

- proximity to several major research universities and other scientific institutions,
- availability of a highly educated work force,
- international transportation access, and
- high quality of life in the community.

Jagiellonian University has been approached by at least one developer of STPs in Europe and the Krakow region is already attracting international business investment.

Jagiellonian University, working on behalf of the Consortium, has taken steps to advance the planning of the STP. In November 1995, Ms. Joanna Karmowska was appointed full-time to work on park development for the university. At the same time, the university requested the assistance from USAID and also entered into an agreement with IDI for the prefeasibility study noted above.

1.3 Background on Science and Technology Parks

[3] The IDI draft report was presented at the March 7 workshop but a final report has not been submitted as of this writing.

There are now over 300 science and technology parks with university affiliations located in the industrialized countries of the United States, Western Europe, and Japan. The United States has 130 such parks, and about 180 are located in the other industrialized countries. While all of these have been developed with some type of linkage to a university, there are a number of different ownership arrangements (see Table 1).

In the United States, virtually every major university has an associated research "park." These may range from quite large establishments, such as the Research Triangle Park with over 2500 Ha and 34,000 total employment, to very small facilities. A significant number of parks actually never get to the point of takeoff; indeed, approximately 20 percent of the 130 parks formally established in the United States have not acquired any tenants. U.S. research parks average slightly over 200 Ha in size while those in Western Europe and Japan average about 80 Ha.

Employment in U.S. research parks varies from 0 to 34,000. Although the average number of employees in research parks in the industrial countries averages about 1400 employees, that number is skewed by a few very large parks. A recent survey of U.S. research parks found that most have employment of fewer than 200 persons.[4]

Table 1. Ownership Arrangements of Science and Technology Parks

[4] Michael I. Luger and Harvey A. Goldstein, *Technology in the Garden: Research Parks and Regional Economic Development* (Chapel Hill: University of North Carolina Press, 1992).

Type of Development	Percent
Joint Venture	21%
University	19%
Nonprofit Authority	15%
Private	14%
Government	10%
Other	6%
Unknown	16%
	100%

Source: Association of University-Related Research Parks.

2. STAGES OF PARK DEVELOPMENT

There is a great deal of variation in the way that research parks have been developed. However, a recent study of U.S. parks describes the process in three main stages, as shown in Table 2. The steps shown in Table 2 are presented roughly in chronological order, particularly in the first, or incubation, stage.

The first stage, called the incubation stage, runs until the park has its first tenant in operation. As noted earlier, a sizable percentage of parks never achieve this milestone. The second stage, called the consolidation stage, is the period in which the park begins to fill with tenants. This stage is dominated by marketing efforts of the park management. This is also the period in which the character of the park may change, depending on the nature of the tenants that are actually attracted to locate in the park. At this point, many parks that were intended as pure "research" parks may come under pressure to allow manufacturing, especially if the park is not attracting enough research establishments to meet its financial targets.

The third stage, called the maturation stage, occurs when the park has attracted a core of tenants and these firms begin to have an impact on other firms in the region. These impacts can be in the form of business linkages or even the creation of spinoff companies in the area. At this stage, research firms in the park may have manufacturing and warehousing operations that need to be accommodated in the nearby area. During this period, satellite parks may be established nearby to provide additional office space, facilities for associated businesses, industrial parks, and hotel/conference centers. If a park is quite successful, the maturation stage may also bring problems of rapid growth (traffic congestion, housing and utility shortages) and create spot labor shortages in key disciplines.

The incubation stage has the most discrete steps since that is the stage where most planning and formal evaluation takes place. It is also the stage that all surviving parks have passed through and therefore is the best documented.

The Krakow STP has passed the first step, concept development, in the incubation stage and is now engaged in the second step, feasibility study. However, there are still some issues concerning the objectives, ownership, and size of the Krakow park that should be revisited. This is an important function of the prefeasibility study, namely to identify those aspects in the conceptualization of the park that need more work.

Table 2. Stages of Research Park Development

Incubation Stage (24 to 36 months)

- Concept Development
- Feasibility Study
- Governing Structure
- Financing Strategy and Incentives
- Working Capital Fund-Raising
- Initial Land Acquisition and Options
- Formal Announcement
- Tenant Recruitment
- Detailed Planning Studies
- Land Sales, Options, and Leases
- Infrastructure Construction
- Speculative Building (for lease)
- Occupation of Space by First Tenant

Consolidation Stage (2 to 10 years)

- Continued Tenant Recruitment
- Exercising of Land Purchase Options to Complete Park
- Infrastructure Completion

Maturation Stage

- Turnover of Tenants
- Development of Spinoff Companies
- Forward and Backward Linkages to Regional Firms
- Congestion and Spot Labor Shortages

Source: Adapted from the stages described in Luger and Goldstein, 1992.

Key additional aspects of the prefeasibility study typically include:

- assessment of the overall “market” for the park,
- identification of specific market segments that should be the target for recruitment,
- assessment of likely success of the proposed park for capturing an adequate target share of the market,
- availability of financial and institutional resources to build and operate the park (including access to investment capital for land acquisition and infrastructure as well as working capital for administration and marketing), and
- any aspects of the initial concept that have important consequences for the financial viability and marketability of the parks (e.g., size, location, tenant restrictions, etc.).

The feasibility study is a key document, and not just as an input into the decision to proceed. It is typically also used for:

- gaining general public support for the project,
- marketing the park to potential firms in the early stages, and
- raising working and investment capital.

Public support is crucial since individuals may be asked to contribute time and money to the development (i.e., to serve on boards, make donations). In addition, the infrastructure for the park will require expenditure of public funds. It should be noted that most failed technology parks in the United States ran out of public support before the park proved viable financially. Even the Research Triangle Park, the most successful of such parks, was not considered to be financially viable until 7 years after start-up.

The Krakow STP has already identified several key industries as target groups, notably biotechnology and molecular biology. These represent particular academic and research strengths of the university. The prefeasibility study should verify this targeting and also suggest other target groups as well, based on market demand. For example, Krakow should be a particularly attractive site for foreign high-technology

firms, in a wide range of disciplines, that want a base to penetrate the Polish and/or Central European markets.

It should be noted that the dominant industries in a given research park are likely to change as the park matures. This suggests that such parks should not be overly specialized at the outset since they will likely have to adapt to a changing client base. This is particularly true of high-technology companies, where the fastest-growing companies today may not have been in existence 15 years ago. For example, the first tenants in the Research Triangle Park were dominated by textile-related research and development (R&D) facilities, all of which are now gone. Furthermore, the site of the RTP was originally selected because of its railroad access, a feature that was never used by any tenants.

3. KEY ISSUES IN THE INCUBATION STAGE

In examining the steps in the incubation stage in light of research park experience elsewhere, there are six that the Krakow park developers should be paying attention to now. These include:

- objectives of the park development,
- size of the park and land acquisition,
- governing structure and ownership arrangements,
- financing arrangements,
- marketing and Incentives to tenants, and
- restrictions on park firms and activities.

3.1 Park Objectives

The Krakow STP has been initially described as a place to attract private firms (both domestic and international) to locate in order to take advantage of research strengths of the university community. Inclusion of a business incubator in the Krakow park plan is intended to foster start-up businesses in high-technology fields. Beyond these general outlines, more detailed objective-setting apparently has not taken place.

In reviewing experience with science and technology parks elsewhere, researchers note that there are two dominant types of objectives:

- to foster the creation and growth of small and medium-sized high-technology companies, and
- to attract R&D branches of national and international companies as well as national government laboratories.

Examples of the first type (small business formation) include the University of Utah Research Park, the Atlanta (Georgia) Advanced Technology Development Center, and the New Haven (Connecticut) Science Park. Examples of the second type (large company R&D branch location) characterize the Research Triangle Park and the

Princeton (New Jersey) Forrestal Center. Stanford Research Park is a combination of the two.

In addition to these two objectives, some early research parks in Europe served as the base for foreign companies to penetrate the European market—e.g., the park at Sophia Antipolis located near Nice, France, which was anchored by IBM and other U.S. computer firms. As noted earlier, the Krakow park may have the same potential to serve as a base for international high-technology firms to penetrate the Polish and Central/Eastern European markets.

For university-owned research parks, there are a number of more specific objectives, as noted by Luger and Goldstein:

- to enhance the university's technical training capability via collaborative research,
- to increase technology transfer,
- to encourage entrepreneurship,
- to increase regional productivity through innovation,
- to generate revenue through land sales and leases,
- to enhance the quality and prestige of the university, and
- to commercialize university-based research.

With the exception of the objective to increase revenues through land sales, all of the other objectives have surfaced at one time as a rationale for the proposed park in Krakow. One of the possible missions of the Krakow park not on this list is its potential role in international technology transfer (including export of Polish scientific expertise.)

The initial planning of the Krakow park has indicated that several specialized institutes will occupy space in the park. This raises another issue, namely the creation of specialized research institutes to anchor the new park. The most notable examples of this arrangement in the United States are the Stanford Research Institute, now named SRI International, and RTI. Both were conceived as multidisciplinary contract research organizations that are self-supporting through contracts undertaken with government agencies and the private sector. Both are “nonprofit” in that any net revenues are reinvested in the institute and not distributed

as profits or dividends to private owners. Both SRI and RTI are large, umbrella institutes with many individual research programs housed in one corporate structure.

SRI was initially created by Stanford University in 1946 and located within the newly created Stanford Research Park on land owned by the university. Subsequently, the institute severed formal ties to the university and was renamed SRI, dropping Stanford from its name.[5] The Research Triangle Institute was created in 1958 by joint action of its three parent universities, Duke University, the University of North Carolina at Chapel Hill, and North Carolina State University (NCSU).

RTI and SRI are among a small number of large, freestanding research institutes in the United States that occupy a niche midway between a university and a consulting firm. These institutes specialize in applied research and may provide technical consulting services and short-term training. Unlike universities, they do not conduct degree-granting education programs nor do they carry out a great deal of basic research. On the other hand, unlike consulting firms, they are nonprofit and specialize in fields with a public purpose such as health, economic development, etc. Most of the major nonprofit research institutes in the United States have formally severed their university ties over the years; RTI is the only major institute that maintains its original relationship to the founding universities.

The Research Triangle Institute occupies a special place in the development of the Research Triangle Park. RTI was created specifically to anchor the Park before any other tenants had been recruited. In the early years of the RTP, the Institute gave the new park a physical presence. RTI's first major research programs were in statistical surveys and in textile chemistry. Both programs were “borrowed” largely from the North Carolina State University faculty. In the case of the statistics program, the key faculty at NCSU actually became full-time employees of the Institute and left their academic appointments. The textile chemistry program has ceased to exist at RTI after 37 years while the statistics program has grown into one of the largest such operations in the United States.

The above discussion raises the issue of the type of research institute that the university might create to serve as a focal point for the Krakow STP. As proposed, the university is setting up several small institutes rather than a single umbrella establishment on the model of RTI or SRI. It might be prudent to revisit this decision

[5] SRI severed its university ties in order to use its contract revenues to fund growth of the Institute rather than have those revenues siphoned off by the university; part of the separation agreement involved an annual payment by SRI to the university.

once the prefeasibility study has been completed and the market demand for the park better established.

The proposal to create a business incubator in the Krakow park also raises some special issues. An incubator requires a complex of support services in addition to office (and possibly) laboratory space. These services mainly include technical support in business planning, financial management, marketing and, on occasion, manufacturing process design as well as the conventional office services. These services require fairly specialized expertise, which argues for having the incubator run as a separate enterprise with its own, specialized staff.

3.2 Size of the Park and Land Acquisition

The proposed park is 30 Ha, which is small by international standards. As noted earlier, the average size of such parks outside the United States (mainly in Europe) is almost three times as large as that proposed in Krakow. Given that Krakow, because of its educational and cultural assets, should be one of the premier locations in Central Europe for such a venture, the proposed size of the STP is quite modest.

On the positive side, the small size limits the risk of the park venture and reduces the overall cost of development. On the negative side, the size also limits the impact of the park on the economy and greatly restricts the ability to provide land and expansion space for companies wishing to locate a large facility in Krakow. Indeed, a single large international firm would likely need more land area than the entire site proposed.[6] Given that the university is already planning to locate several institutes on the site, room for private firms is severely limited and expansion beyond the start-up phase for many firms will not be possible.

The experience elsewhere with successful research parks is that growing firms need additional space nearby, even if not within the park itself. For high-technology firms, much of this expansion space is not laboratories but conventional office space (albeit outfitted with good communications systems.) This expansion demand is often met by private developers who build rental office space near to the research park, but this tends to occur only after the demand for the space is well established. This means that there is a lag time between the need for additional space and its

[6] Manufacturing firms in the United States typically purchase sites in industrial parks equal to eight times the land area of the initial facility to allow for expansion and associated needs (parking, loading areas, landscaping, recreation.) Although comparable data are not available for R&D facilities, most research parks are developed with a target of devoting only about 20 to 30 percent of land area to buildings and parking areas.

availability on the private market. During this period, expanding firms may simply bid up the price of office space in the area or they may relocate to a bigger facility, usually in the same city.

Many R&D firms located within research parks have linkages to manufacturing and warehousing operations that need to be accommodated in the surrounding region. This suggests that the Krakow STP should not be developed in isolation from planning for industrial park sites convenient to the STP location. Given that high-technology manufacturing usually requires road and air access, such industrial park sites should be located in the vicinity of the airport and ring road. This arrangement will also affect communications networks since the firms in the STP will need to communicate frequently with their partners in the industrial sites.

One very pragmatic issue regarding park size is financial viability. Most parks obtain their operating revenues from land sales and/or leases. A small park can generate limited revenues which, in turn, can support only a limited administrative operation (management, marketing, etc.). Part of the prefeasibility study, as noted above, should address the issue of whether the proposed size is sufficient to generate adequate operating revenues. Otherwise, the university and/or city may have to subsidize the administrative costs of the parks on a continuing basis.

Given the small size of the proposed Krakow STP, there should be provision for expansion contingencies. These could be in the form of additional land designated for R&D facilities (via zoning or some type of municipal master planning) and/or having options to purchase additional land for expansion of the university complex.

Many research parks, particularly in the United States, have been developed in stages with an initial block of land owned outright by the park owner supplemented by land held as options-to-buy by the park owner. The option gives the right to the park owner to buy the land at a certain price on or before a set date. The option may, or may not, be renewable. The use of options-to-buy has several advantages in research park development. First, the park owner does not have to tie up as much capital in land purchases at the outset. Second, if the park succeeds, then the park owner reaps the benefit of developing and selling off additional land—land that has been made valuable by the efforts of the park owner.

3.3 Governing Structure

The members of the Krakow STP Consortium are in the process of signing articles of incorporation. The corporate structure currently envisioned is a form of a joint stock company whose members contribute start-up capital and can receive dividends on earnings from the development. We note that the members of the Consortium are

all governmental bodies, public universities and a state enterprise undergoing privatization. Whereas profit-making joint ventures are common among the group of research parks found in the United States and Western Europe, it is not common to have so large a body of "owners" of a public nature engaged in a for-profit venture.

The type of governing structure should be tied to the objectives of the park as well as to the size of the development. There are three main types of ownership models that are most common in other countries:

- nonprofit corporation (public authority),
- university enterprise, and
- joint venture with private developer.

The governing entity may be separate from the management entity—that is, the governing entity may operate the park directly with its own staff or it may contract the day-to-day management to a private firm.

Nonprofit Corporation

Many of the large research parks in the United States are run by nonprofit corporations, which have essentially the same structure as local public enterprises (e.g., water authorities.) Nonprofit corporations are run on a self-financing basis and are operated in the "public interest." They are commercial but do not have shareholders. Rather, the corporation is run by a board of directors whose membership is determined by the charter of the corporation. Many research parks with university affiliations specify that a majority of the board members will be appointed by the university.

The board hires the chief executive of the park, who in turn is responsible for lower-level staffing decisions. The staff prepares the annual budget of the park, which is subject to approval by the board. In the United States, nonprofit corporations are exempt from paying income tax (although employees are taxed on their income) and therefore must meet certain regulations of the federal and state tax codes. Most are empowered to receive donations that are tax exempt (often in the form of land.)

The staffs of most research parks are quite small since their main function is to recruit tenants and sell land. Furthermore, most research parks cannot afford to maintain large staffs since they are self-financing and the only source of revenue is land sales and leases (revenue is lean in the start-up

years and is variable from year to year). In many cases, affiliated universities may second staff to the park authority in the early years before revenues are sufficient to maintain the staff.

Because public authorities do not distribute profits, any net revenues are reinvested in the park itself. Normally, research parks are developed in stages. Net revenues from land sales in the early stages are invested in additional land purchases and infrastructure expansion for the latter-stage developments. Much of the land of research parks in the United States is not purchased outright but is held as options to purchase. As these options come due, the park authority has to generate the funds to purchase the land (or extend the option) or let the option lapse.

Setting up a nonprofit corporation is a lengthy undertaking and involves considerable community support, especially from board members. In the start-up of the Research Triangle Park in the mid-1950s, many board members were also asked to donate toward the initial operating funds of the park authority (named the Research Triangle Foundation). Because the viability of a research park depends on attracting tenants, board members are often chosen from among the business community in hopes that their contacts will produce tenants. Board members are also chosen with an eye on strong political connections with the aim of attracting government-funded facilities to locate in the park.

A nonprofit authority operates on the same business principles as a private firm and is held to strict accounting standards. In fact, because such authorities are a public trust and may have tax advantages, they are often held to higher accounting standards than private firms. As part of the normal accounting procedures, nonprofit authorities must make their financial records available to the public. Typically, these would include at least two key annual documents:

- balance sheet of assets and liabilities, and
- summary of revenues and expenditures.

For internal financial management, research park authorities also must prepare additional key documents:

- annual operating budget, including sources of revenue and objects of expenditure;

- multiyear capital budget, usually on a rolling 5-year basis; and
- detailed cash flow projections (done monthly during the incubation period).

These financial management records are basically the same as those maintained by well-run private firms. This means that research park authorities follow commercial accounting practices and standards rather than government accounting standards.

University Enterprise

Approximately one-quarter of all research parks in the United States are run solely by universities. The percentage in Europe and Japan is slightly lower.

Much of what is discussed in the preceding section on nonprofit corporate ownership pertains to the ownership model involving sole university control. The first decision for the university is whether to set up the venture as a separate enterprise or as part of the university administration. In the United States it is common for universities to retain sole control when they are developing the research park primarily as a profit-making real estate venture. Because many universities (mainly private) have extensive land holdings, such real estate developments are viewed primarily as income generators. This does not appear to be the case in Krakow.

It is prudent financial management for the university to run the research park as a separate enterprise with segregated financial accounts, budgets, and revenue streams. This does not mean that the university does not subsidize the venture in some form (e.g., staff secondment) but it does mean that the park operates as a separate "cost center." At a minimum, this procedure allows the university to monitor the financial operations of the park and gauge the financial impact of the park development on the university budget.

Such financial autonomy works in both directions. It also makes clear when the research park is generating profits and keeps the university from siphoning off needed revenues. For example, the research park may be generating excess cash flow from land sales that it needs to exercise additional land options in order to keep the park growing; it is a great temptation for the university administration to take that temporary cash surplus and use it for general operating expenses of the university, leaving the park without the funds to grow. This is the main reason for setting up public authorities separate from other government structures, including universities.

A third reason for separating the park venture from the university administration is the need for professional management. Parks are largely in the business of tenant recruitment and land development, not academics. The university needs to maintain oversight and provide guidance but professionals need to be hired to run the operation.

Public/Private Joint Venture

A public/private joint venture is one in which a partnership is created between a public partner (university and/or city government) and private developer. Ideally, the developer would be experienced in the start-up and management of high-technology parks. In this scheme, the public partner would surrender some ownership and control, but the risks would be shared and lessened by the inclusion of a development expert as a full partner. Decision-making authority would likely be related to the equity holding of each partner, with protection against a veto by the other partner(s) in the joint venture.

About one-fifth of all university-related research parks around the world are run on a joint venture arrangement. There are different forms of joint ventures, with the most common consisting of two partners, a university and a private development company. However, other forms are not uncommon. For example, the Science Park in New Haven, Connecticut, was created as a joint venture among Yale University, the City Government, and the Olin Corporation. The three entities formed a development corporation that manages the park. The city was also instrumental in securing a $2 million grant from the state government to rehabilitate an industrial building for the park.

The public/private joint venture is typically run on a for-profit basis, although the creation of large net profits may not be the most important objective. In these cases, the private partner may achieve his objectives through construction contracts and management fees, rendering the need for overall profits from the partnership secondary. Indeed, the private partner may be willing to see the partnership suffer a net loss if the associated (private) contracts are sufficiently lucrative.

Most joint ventures involve the public partner contributing land and the private partner assuming the management role. As noted above, the private partner(s) may also have separate contracts for other aspects of the operation such as construction, office space leasing, general management, engineering and feasibility studies, marketing, etc. Obviously, the public partners need to be careful in how such deals are structured in order to protect their interests.

The advantages of a public/private joint venture are several. Because the private partner is an owner, he has a stake in making the park a success. This arrangement should reduce the overall management burden on the public partner and bring in more professional expertise in park development from the developer. Such an approach lessens the financial burden on the public partner; in fact, the joint venture deal can be structured in such a way as to

further reduce the financial burden by giving the private partner a higher share of profits (either with or without reducing control by the public partner).

One drawback of such joint ventures is the complexity of setting them up so that both sides are adequately protected. Such ventures are also messy to terminate if one side is unable, or unwilling, to meet its obligations. Given the novelty of such types of transactions in Poland today and the untested legal waters of dissolving a failed joint venture in research park development, crafting such a joint venture would require a leap of faith and some very complex negotiations.

Public/private joint ventures may also involve different sources of financing. In the United States, where local governments can raise long-term financing for projects at low interest rates,[7] local governments often become the vehicle for borrowing start-up funds for a research or industrial park development. Section 3.4 below describes the financing alternatives in detail.

One variation on the joint venture approach is to have the public partner turn over virtually all control to the private developer. The main way that this is done is for the public partner (university) to sell or lease all of the land to the developer, retaining some control via performance conditions on the sales/lease agreements and establishing minimum standards with regard to aspects of park usage: density, design, architectural review, environmental conditions, infrastructure, amenities, etc. This setup would allow the public partner to retain some control but would remove it from active participation.

A public partner may achieve many of the results of a joint venture by hiring private firms on separate contracts, including a management contract. On the other hand, this arrangement would place a heavy management burden on the university since it would retain all control of the development.

3.4 Financing Arrangements

Financing arrangements must deal with the routine operating costs of the park as well as the capital investment requirements of park infrastructure and, where

[7] U.S. local governments are able to do this by issuing tax-exempt bonds on the private capital markets. The interest paid on such bonds is exempt from income taxation by the federal and state governments in which the bonds are issued if the bonds are used to finance "public purpose" projects.

necessary, land acquisition. A particular issue in park start-up phases is the cash-flow problem, since revenue inflow is tied to land sales and leases that are “lumpy” and not predictable.

Virtually all research parks rely on land sales and/or leases to generate the operating revenues of the park and repay land acquisition and development (including on-site infrastructure). Local governments may subsidize some of the start-up costs of a park with a view that its economic development impact will more than repay the initial subsidy. That is, tax revenues from the park itself (property taxes, corporate income and sales taxes) as well as taxes generated on park workers are viewed as long-term justification for the expenditure of public funds at the outset. These subsidies may be outright grants or they may come in the form of tax forgiveness. The most common form of tax forgiveness in the United States is exemption from local property taxes. This issue of tax forgiveness is discussed in more detail under Section 3.5, Marketing and Incentives to Tenants.

Because of the cash flow problem in new parks, most park authorities attempt to develop a cushion of working capital to carry them through the incubation stage, which normally takes 2 to 3 years until sales revenues start coming in. It is also important during this stage to minimize expenditures and to focus most activity on recruiting tenants. Many university-related research parks try to keep full-time staffing costs to a minimum, having faculty make marketing visits to prospective clients.[8]

Raising large blocks of investment capital presents more problems, especially for infrastructure. It is important to distinguish between on-site and off-site infrastructure— i.e., that infrastructure found within the boundaries of the park itself and that required to support the park externally. Examples of the latter include trunk roads, which will be a major expense in Krakow given the unserviced nature of the site and the need to link the site to both the city center and the ring road/airport. These investments do not just serve the research park and university but are critical to the park's success.

The on-site infrastructure requirements are fairly simple and include extension of major utility services plus secondary road construction. Normally, we would expect

[8] All of the early marketing of the Research Triangle Park was carried out by faculty and by Research Triangle Foundation (RTF) Board members. The first staff of the RTF consisted of two people: a full-time director seconded from the university faculty and one administrative staff member.

the service utility companies (electricity, telephone, water and sewer)[9] to extend lines into the park in accordance with their normal policies of cost recovery for service extensions. One issue is the reliability of electric power supply and telecommunications service. Some research parks now require a very high degree of electricity service (uninterruptible supply and limited voltage fluctuations), which may require additional investments by the electric utility. Reliable telecommunications service (quality and capacity) is likewise a key ingredient in attracting high-technology companies. It is essential in attracting not only foreign companies but also domestic high-technology companies because their markets and suppliers are increasingly international.

Given the small size of the proposed Krakow park relative to the whole area that will ultimately be developed, it is reasonable to consider a financing strategy for the entire area. Basically, the city has two main strategies for financing infrastructure expansion to the area. First, the city could assume the financial responsibility directly and recover costs as best it could through normal sources of general revenues. To do this it would probably have to get a combination of grants and loans or even issue bonds.

The second option would be to treat the service area as a "special district" and recover the infrastructure costs from the land owners within the district. This method is commonly used in the United States for such financing. In fact, bonds may be issued by local governments that are backed by both special assessments and property tax increments levied on the landowners. The use of special-district designation has some problems in Krakow because the proposed uses of the area will be heavily dominated by the university campus and park land as well as the science and technology park. One solution may be to expand the special district in order to include all land parcels that will benefit from the new infrastructure (especially the new roadways). Alternatively, the city may impose "impact fees" on future land development in the affected area. These fees are designed to recover the costs of infrastructure from future owners who will benefit from the availability of the infrastructure.

In the United States, some park developments are financed by bonds issued by local governments. Such financing goes under the label of "Industrial Development Bonds" and is guaranteed both by the local taxing authority of the local government and by the projected revenues of the park development (i.e., land sales.) In many cases, the park development may be incorporated as a separate authority (a "special

[9] District heating may or not be included as a local utility service in the target area. If it is not provided as a public utility, then either the university or the park developer may have to include it as an onsite investment cost.

district”), which allows it to impose special charges on the landowners within the park.

3.5 Marketing and Incentives to Tenants

The key activity of all research park developers, whether private or public sector, is to attract tenants. Virtually the first item produced by any park is a marketing brochure, even while the park may still be just an idea. The first brochure of the Research Triangle Park mainly touted the resources of the three universities and not the Park itself since there was nothing in the RTP but empty farmland at the beginning.

We will not devote much attention here to the form and content of marketing materials, but only point out that such materials need to convey the main objectives of the park and to highlight the assets of the entire community, not just the park itself. In marketing the park, planners need to keep in mind that the decision to locate in a given research park depends more on the overall attractiveness of the area than on the specific physical attributes of the park.

Park developers use a number of incentives to attract tenants. These fall into the categories of (a) financial inducements, (b) special facilities and relationships, (c) efficiency measures, and (d) quality of life.

Financial Inducements

Tenants in research parks may be afforded certain tax advantages, the chief one being exemption from certain local taxes. In the United States, this local tax exemption is almost always targeted to the local property tax, which typically averages 1 percent annually of the market value of the land and buildings. About one-quarter of research parks in the United States have this tax advantage. A variation on this theme is the designation of the research park as a special district with the proviso that the area cannot be annexed by another local government and subjected to its property taxation.

Research parks may also receive indirect financial incentives by having access to special infrastructure that is provided at public expense. It is quite common for such parks to receive special treatment in receiving higher-standard utility services than the surrounding areas. One of the main ways this is done is via special bond financing of infrastructure, as discussed in the preceding section.

One of the most important inducements for foreign firms to locate in a given park is not so much tax forgiveness as tax predictability. Private firms are wary of committing to locating in a new country if they cannot be relatively certain about future tax liability. This means that there must be assurances

that taxation policies of both the national and local governments (provincial and municipal) are not going to change precipitously. Unfortunately, in the current economic conditions of Central Europe, many local governments view private industry as a source of untapped wealth that can be taxed highly. This attitude only discourages foreign firms from entering those countries.

Special Facilities and Relationships

The most common special facility or relationship offered by research parks is access to the local university. Such affiliations may run the gamut from mere access to university libraries to availability of graduate students, sharing of laboratories and computer facilities, and joint faculty appointments on the staff of companies in the research parks. Universities may offer special arrangements for park staff to undertake degree and non-degree programs.

Research parks may also have access to special services of vocational training schools; in many cases, public vocational schools will establish custom-designed courses for high-technology workers to serve the needs of individual companies located in the research park.

Efficiency Measures

Research parks make it convenient for new firms to establish operations within the park by consolidating the permitting procedures and facilitating regulatory approvals. Research parks can expedite hookups to utility services and may even help firms with recruiting local staff.

Some parks provide business incubators for start-up companies, which greatly lessens both the start-up costs and failure rate for those companies. Many parks also contain general service areas where temporary office space can be rented and supporting business services are available.

Quality of Life

Research parks endeavor to provide an attractive place to work with considerable open space (the “park” atmosphere), recreational facilities, and attractive buildings. Research parks are aimed at a clientele that places a premium on a high-quality work environment. The scientists and researchers at these companies are highly paid and, more importantly, highly mobile. Their technical skills make them more mobile than industrial production

workers and they move frequently among high-technology companies and between such companies and the university community.

One finding in the studies of successful research park development is that the park-like setting alone is not critical. Rather, companies and highly skilled staff are attracted to concentrations of high-technology firms and universities. There must already be a pool of like-minded people and activities in an area to attract more. This means that the most successful places for research parks are those with heavy concentrations of universities, cultural activities, good schools, and a pleasant living environment. The park-like setting of the research park itself is secondary.

3.6 Restrictions on Development

Most research parks place restrictions on the types of firms that can locate within the park and the types of activities that the firms can conduct. In addition, many parks have building restrictions concerning maximum area that can be constructed, height and setback restrictions, signage controls and, in some cases, architectural review.

Attempting to maintain the park-like nature of research parks, most U.S. parks try to limit the built-up areas to less than 30 percent of the total area. The Research Triangle Park is the most restrictive, with a limitation of 15 percent buildable area as well as height restrictions. Some urban research “parks” have abandoned the park atmosphere out of necessity since they have little space and may even be located within rehabilitated factories.

Most research parks try to attract only the research operations of private firms and governmental agencies. Some parks do not allow manufacturing activities of any kind, although most of these allow the construction of prototypes and, in some cases, assembly of manufactured parts. Many parks allow “light manufacturing” only; most prohibit warehousing and distribution centers.

The use of restrictions requires careful consideration. On the one hand, it is needed to maintain the character of the park and to reassure tenants that the nature of the park is safeguarded. Such controls are viewed as maintaining the prestige of the park and keeping it a desirable location for other firms. On the other hand, such restrictions can keep good tenants away. Furthermore, the nature of the business of high-technology firms can change quickly and the line between research and manufacturing often blurs. For example, is the creation of individually customized semiconductor chips a manufacturing activity or a research activity? Restrictive covenants of research parks must be able to deal with such questions.

4. CONCLUSIONS AND NEXT STEPS

The preceding sections have described, in summary form, the varied experience of research parks in the United States and other industrialized countries. These issues were raised and discussed in the workshop on March 7. However, none of these issues has yet been formally resolved by the Consortium. Furthermore, many of these issues are properly the subject of a more in-depth feasibility study.

At this point, the general feasibility of the concept of a Krakow STP has been established. Now there are a number of specific steps that should be pursued. The following discusses these next steps in chronological order.

CONSORTIUM FORMATION

The Consortium needs to complete the process of incorporation and make some basic decisions about how the Consortium will govern the park development. At present there is no detailed organizational structure and, hence, no formal decision-making process. The Consortium is raising a modest amount of funds from the members of the Consortium at the outset to serve as working capital. The Consortium should have a rough budget for the first 2 years of operation so that the members know what the total budgetary requirements are likely to be, even if those funds will have to be raised from outside (see Detailed Feasibility Study, below).

DETAILED FEASIBILITY STUDY

The Krakow STP needs an in-depth feasibility study that goes well beyond the prefeasibility report. The feasibility study must realistically examine the resources available to develop the STP and propose a development plan that is achievable. This plan will necessarily identify the market for the park and help the Consortium narrow its focus. A major concern of the feasibility study must be the financing arrangements. The first issue is the operating revenue base of the park and the creation of working capital. A parallel issue is the decision on how the costs of the infrastructure services will be recovered and what the source of funding for the infrastructure investment will be. Related to these financing issues is the question of whether the park tenants will be afforded any special tax privileges. The area of the STP has been designated a special development zone by the city and is also included in a proposal for Special Economic Zone (SEZ) status submitted to the national government.

Both the city and national SEZ designations carry tax breaks that should affect the amount of general tax revenues that development of the site will generate; these tax impacts should be factored into the financial analysis.

PARK MANAGEMENT PLAN

Closely related to the need to establish a formal decision-making process within the Consortium is the need for a management unit that is staffed full-time to handle the day-to-day operations of the park. As noted earlier, this need not (in fact, should not) be a large group but it must be adequate to handle the work entrusted to it. This unit should be headed by a person with proven capability in management and demonstrated entrepreneurship. In the early days, this person will have to be creative, marketing-oriented, and able to develop a productive working relationship with the Consortium. Although this person might have some advanced academic credentials, notable research skills or academic standing are not high on the list of qualifications. The STP management unit must have a close working relationship with the city administration to facilitate the securing of permits and the installation of infrastructure. One of the noted advantages of a park development is that these activities can be handled by park management on behalf of the tenants—this is particularly the case for foreign firms seeking a first-time location in Poland.

PHYSICAL MASTER PLAN

The master plan must be completed as soon as possible to help establish the costs of developing the site, including both on- and off-site infrastructure. A decision will have to made early about the coverage of the master plan—i.e., whether it covers just the STP or the larger area. Because the infrastructure needed for the STP will also affect the development of the larger area, it makes sense to prepare an overall infrastructure guide plan for the area as well as a detailed master plan for the STP. The main infrastructure elements probably will have to be phased and this phasing must be worked out in advance. There is an immediate need to make sure that the infrastructure is adequate for a start-up phase of the STP within the next 12 to 24 months.[10] There is obvious interplay between the master plan and the feasibility study,

[10] The city administration has an even more optimistic schedule to begin groundbreaking by the end of the current calendar year, primarily in response to inquiries already being made by potential tenants.

with financing as the crucial linkage. In addition, decisions about whether to construct buildings for leased space and whether to develop a business incubator will affect the master planning. The master plan should be somewhat flexible so that the site can be developed and modified to suit future tenants.

COMPLETE LAND ASSEMBLY

As noted above, there are unresolved questions about the size of the park and the possible desirability of making the park larger than originally planned. Alternatives for expanding the size need to be explored. In addition, the development of associated industrial and warehousing locations needs to be planned in conjunction with the STP, even though such provision need not be made in the initial land assembly package. The Consortium does need a land assembly strategy, which will involve decisions about how much land to purchase outright and how much to tie up in options to buy.

INFRASTRUCTURE CONSTRUCTION

The construction phases will be undertaken in accordance with the master plan, which will have various decision and "trigger" points—for example, the decision to construct certain infrastructure components may be contingent upon reaching a specified level of tenant recruitment. The start-up phase needs to be well programmed because it is likely to be undertaken in the very near future. This means that the engineering drawings must be completed, permits secured, construction contract specifications drawn up, and construction management unit prepared and ready to execute the plan. Furthermore, the capital financing for the start-up phase needs to be arranged in advance since it cannot be put in place overnight. In addition, potential tenants need to be assured that the financing for infrastructure extension is in place before they make a final location decision.

MARKETING AND TENANT RECRUITMENT

Marketing and tenant recruitment have already begun informally. The marketing efforts should proceed on two parallel tracks. The first track is to identify candidate tenants for the STP so that the marketing can be well targeted; this should be one of the primary objectives of the feasibility study. The second track is to develop marketing materials for the STP. The marketing materials should cover two aspects in particular:

- the qualities of the Krakow area for attracting high-technology companies (the city administration already has some very high quality promotional materials to fill this need); and

- specific information on the attributes of the STP that makes clear what is being offered, how the park management can facilitate a decision to locate there, what special incentives are being provided, and how an interested tenant can learn more about the park.

Once the STP management unit is staffed, it would be useful for the head of the unit to visit several successful parks to study the marketing steps and materials. It should be noted that the STP management unit will become a focal point for all types of businesses inquiring about Krakow, many of which will not be suitable candidates for the STP. The park management should have a way of directing these to the appropriate agencies in the city so those opportunities are not lost.

Table 3 summarizes the action items that have been described in this section and should form the basis for the next steps of the Consortium.

Table 3. Action Items in Next Steps

- **CONSORTIUM FORMATION**
  - **Establish governing structure**
  - **2 year operating budget**
- **FEASIBILITY STUDY**
  - **Prepare detailed Terms of Reference**
  - **Conduct study**
- **PARK MANAGEMENT PLAN & STAFFING**
  - **Prepare job description of Manager**
  - **Recruit & hire Manager**
  - **Form working relationship with city departments**
- **PHYSICAL MASTER PLAN**
  - **Infrastructure guide plan for area**
  - **Detailed master plan for Park**
  - **Startup Phase prepared first**
- **COMPLETE LAND ASSEMBLY**
  - **Develop land assembly strategy**
  - **Complete first phase assembly**
- **INFRASTRUCTURE CONSTRUCTION**
  - **Separate into phases**
  - **Detailed programming of startup phase**
  - **Raise capital financing for startup phase**
- **MARKETING & TENANT RECRUITMENT**
  - **Identify primary target audience**
  - **Review marketing experience elsewhere**
  - **Prepare materials**

Appendix A — map of the site

bbbb